SCLS132E - DECEMBER 1982 - REVISED SEPTEMBER 2003

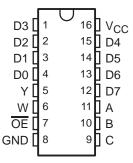
- 3-State Version of 'HC151
- Wide Operating Voltage Range of 2 V to 6 V
- High-Current 3-State Outputs Interface Directly With System Bus or Can Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80-μA Max I_{CC}
- Typical t_{pd} = 9 ns
- ±6-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- Perform Parallel-to-Serial Conversion
- Complementary Outputs Provide True and Inverted Data

description/ordering information

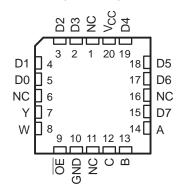
These data selectors/multiplexers contain full binary decoding to select 1-of-8 data sources and feature strobe-controlled complementary 3-state outputs.

The 3-state outputs can interface with and drive data lines of bus-organized systems. With all but one of the common outputs disabled (in the high-impedance state), the low impedance of the single enabled output drives the bus line to a high or low logic level. Both outputs are controlled by the output-enable (\overline{OE}) input. The outputs are disabled when \overline{OE} is high.

SN54HC251 . . . J OR W PACKAGE SN74HC251 . . . D, DB, N, NS, OR PW PACKAGE (TOP VIEW)



SN54HC251 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

ORDERING INFORMATION

TA	PACKA	GE†	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube of 25	SN74HC251N	SN74HC251N
		Tube of 40	SN74HC251D	
	SOIC - D	Reel of 2500	SN74HC251DR	HC251
		Reel of 250	SN74HC251DT	
-40°C to 85°C	SOP - NS	Reel of 2000	SN74HC251NSR	HC251
	SSOP - DB	Reel of 2000	SN74HC251DBR	HC251
		Tube of 90	SN74HC251PW	
	TSSOP - PW	Reel of 2000	SN74HC251PWR	HC251
		Reel of 250	SN74HC251PWT	
	CDIP – J	Tube of 25	SNJ54HC251J	SNJ54HC251J
–55°C to 125°C	CFP – W	Tube of 150	SNJ54HC251W	SNJ54HC251W
Ī	LCCC - FK	Tube of 55	SNJ54HC251FK	SNJ54HC251FK

[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



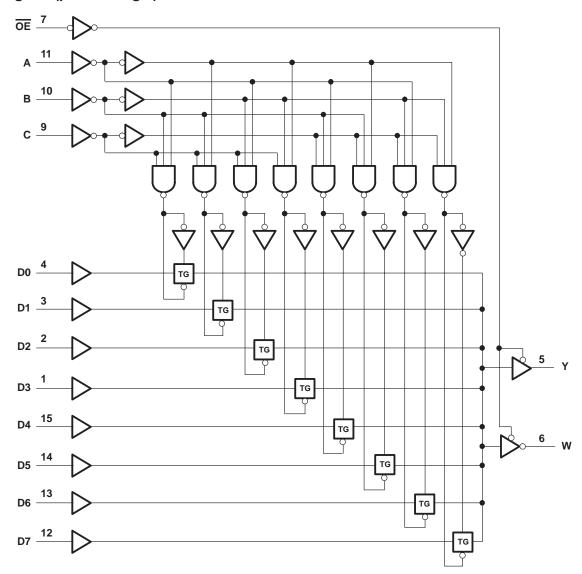
FUNCTION TABLE

	INP	OUTI	PUTS		
	SELECT	•	OE	v	10/
С	В	Α	OE	Y	W
Х	Χ	X	Н	Z	Z
L	L	L	L	D0	D0
L	L	Н	L	D1	D1
L	Н	L	L	D2	D2
L	Н	Н	L	D3	D3
Н	L	L	L	D4	D4
Н	L	Н	L	D5	D5
Н	Н	L	L	D6	D6
Н	Н	Н	L	D7	D7

D0, D1 . . . D7 = the level of the respective D input



logic diagram (positive logic)



Pin numbers shown are for the D, DB, J, N, NS, PW, and W packages.

SN54HC251, SN74HC251 DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V _{CC}		–0.5 V to	ว 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see	ee Note 1)	±20) mA
Output clamp current, IOK (VO < 0 or VO > VCO	c) (see Note 1)	±20) mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})		±35	5 mA
Continuous current through V _{CC} or GND		±70) mA
Package thermal impedance, θ _{JA} (see Note 2):	D package	73°	C/W
	DB package	82°	C/W
	N package	67°	C/W
	NS package	64°	C/W
	PW package	108°	,C/W
Storage temperature range, T _{stq}		-65°C to 15	50°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions (see Note 3)

			SN	154HC25	i1	SN	174HC25	1	UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	UNII
Vcc	Supply voltage		2	5	6	2	5	6	V
		V _{CC} = 2 V	1.5			1.5			
٧ _{IH}	High-level input voltage	V _{CC} = 4.5 V	3.15			3.15			V
		VCC = 6 V	4.2			4.2			
		V _{CC} = 2 V			0.5			0.5	
VIL	Low-level input voltage	V _{CC} = 4.5 V			1.35			1.35	V
		V _{CC} = 6 V			1.8			1.8	
VI	Input voltage		0		VCC	0		VCC	V
Vo	Output voltage		0		VCC	0		VCC	V
		V _{CC} = 2 V			1000			1000	
Δt/Δν	Input transition rise/fall time	$V_{CC} = 4.5 \text{ V}$			500			500	ns
·	V _{CC} = 6 V			400			400		
TA	Operating free-air temperature		-55		125	-40		85	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.



NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

^{2.} The package thermal impedance is calculated in accordance with JESD 51-7.

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

24244555	7507.00	NIDITIONS	.,	Т	A = 25°C	;	SN54H	IC251	SN74H	C251	
PARAMETER	TEST CC	ONDITIONS	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT
			2 V	1.9	1.998		1.9		1.9		
	$I_{OH} = -20 \mu A$	$I_{OH} = -20 \mu A$	4.5 V	4.4	4.499		4.4		4.4		
Voн	VI = VIH or VIL		6 V	5.9	5.999		5.9		5.9		V
		$I_{OH} = -6 \text{ mA}$	4.5 V	3.98	4.3		3.7		3.84		
		$I_{OH} = -7.8 \text{ mA}$	6 V	5.48	5.8		5.2		5.34		
			2 V		0.002	0.1		0.1		0.1	
		$I_{OL} = 20 \mu A$	4.5 V		0.001	0.1		0.1		0.1	
VoL	VI = VIH or VIL		6 V		0.001	0.1		0.1		0.1	V
		I _{OL} = 6 mA	4.5 V		0.17	0.26		0.4		0.33	
		$I_{OL} = 7.8 \text{ mA}$	6 V		0.15	0.26		0.4		0.33	
lį	$V_I = V_{CC}$ or 0		6 V		±0.1	±100		±1000		±1000	nA
loz	$V_O = V_{CC}$ or 0,	$V_I = V_{IH}$ or V_{IL}	6 V		±0.01	±0.5		±10		±5	μΑ
ICC	$V_I = V_{CC}$ or 0,	IO = 0	6 V			8		160		80	μΑ
Ci			2 V to 6 V		3	10	·	10		10	pF

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

	FROM	то	.,	T,	4 = 25°C	;	SN54H	IC251	SN74H	C251																															
PARAMETER	(INPUT)	(OUTPUT)	vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT																														
			2 V		58	205		300		256																															
	A, B, or C	W or Y	4.5 V		21	41		60		51																															
			6 V		19	35		51		44																															
^t pd			2 V		44	195		283		244	ns																														
	Any D	W or Y	4.5 V		17	39		57		49																															
			6 V		15	33		48		41																															
			2 V		30	145		210		181																															
^t en	ŌĒ	W or Y	4.5 V		10	29		42		36	ns																														
			6 V		9	25		36		31																															
										2 V		25	195		283		244																								
^t dis	ŌĒ	W or Y	4.5 V		15	39		57		49	ns																														
			6 V		14	33		48		41																															
			2 V		20	75		110		95																															
t _t	Wo	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	4.5 V		8	15		22		19	ns
			6 V		6	13		19		16																															

SN54HC251, SN74HC251 DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS SCL\$132E - DECEMBER 1982 - REVISED SEPTEMBER 2003

switching characteristics over recommended operating free-air temperature range, C_L = 150 pF (unless otherwise noted) (see Figure 1)

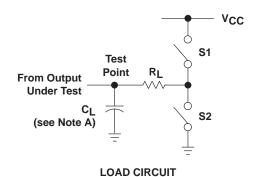
	FROM	то	.,	T	λ = 25°C	;	SN54H	C251	SN74H	IC251											
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT										
			2 V		72	300		450		375											
	A, B, or C	W or Y	W or Y	4.5 V		25	60		90		75										
			6 V		22	52		77		65											
^t pd			2 V		59	300		450		375	ns										
	Any D	W or Y	W or Y	4.5 V		21	60		90		75										
			6 V		18	52		77		65											
			2 V		50	230		340		285											
t _{en}	ŌĒ	W or Y	W or Y	W or Y	4.5 V		17	46		68		57	ns								
			6 V		15	40		58		50											
			2 V		45	210		315		265											
t _t	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	W or Y	4.5 V	·	17	42		63		53	ns
			6 V		13	36		53		45											

operating characteristics, $T_A = 25^{\circ}C$

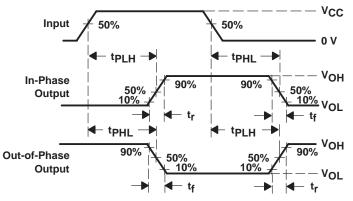
	PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance	No load	70	pF



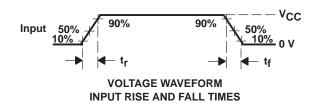
PARAMETER MEASUREMENT INFORMATION

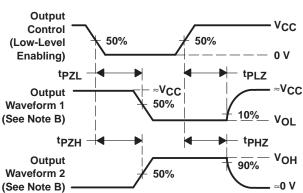


PARAI	METER	RL	CL	S1	S2	
	^t PZH	1 k Ω	50 pF	Open	Closed	
t _{en}	tPZL	1 K22	or 150 pF	Closed	Open	
4	tPHZ	1 k Ω	50 pF	Open	Closed	
^t dis	tPLZ	1 K22	50 pr	Closed	Open	
t _{pd} or	t _{pd} or t _t		50 pF or 150 pF	Open	Open	



VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES





VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

- NOTES: A. C_L includes probe and test-fixture capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR \leq 1 MHz, $Z_O = 50 \Omega$, $t_r = 6 \text{ ns}$, $t_f = 6 \text{ ns}$.
 - D. The outputs are measured one at a time with one input transition per measurement.
 - E. tpLz and tpHz are the same as tdis.
 - F. tpzL and tpzH are the same as ten.
 - G. tpLH and tpHL are the same as tpd.

Figure 1. Load Circuit and Voltage Waveforms







6-Feb-2020

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
85125012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	85125012A SNJ54HC 251FK	Samples
8512501EA	ACTIVE	CDIP	J	16	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8512501EA SNJ54HC251J	Samples
SN54HC251J	ACTIVE	CDIP	J	16	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	SN54HC251J	Samples
SN74HC251D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251DBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251DT	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251N	ACTIVE	PDIP	N	16	25	Green (RoHS & no Sb/Br)	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HC251N	Samples
SN74HC251NSR	ACTIVE	so	NS	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SN74HC251PWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HC251	Samples
SNJ54HC251FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	85125012A SNJ54HC 251FK	Samples



PACKAGE OPTION ADDENDUM

6-Feb-2020

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54HC251J	ACTIVE	CDIP	J	16	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8512501EA SNJ54HC251J	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (CI) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN54HC251, SN74HC251:

Catalog: SN74HC251



PACKAGE OPTION ADDENDUM

6-Feb-2020

Military: SN54HC251

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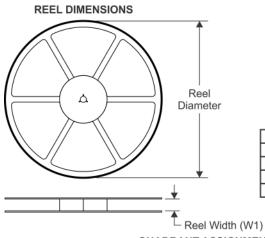
NOTE: Qualified Version Definitions:

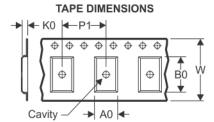
- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

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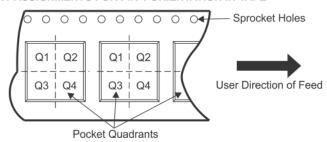
TAPE AND REEL INFORMATION





		Dimension designed to accommodate the component width
		Dimension designed to accommodate the component length
	K0	Dimension designed to accommodate the component thickness
	W	Overall width of the carrier tape
Γ	P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

All differisions are nominal												
Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HC251DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HC251NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74HC251PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HC251PWT	TSSOP	PW	16	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

www.ti.com 16-Oct-2019



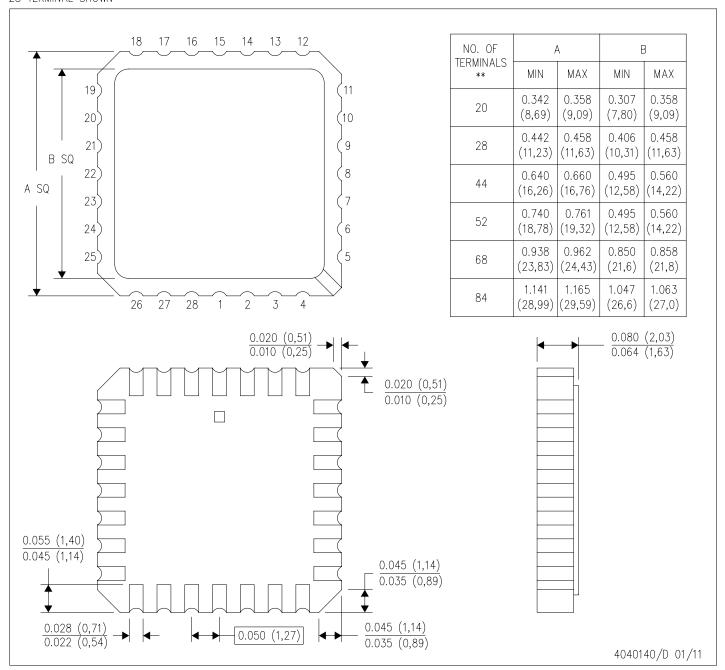
*All dimensions are nominal

7 till dilliforioriorio di o riorinirial							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC251DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74HC251NSR	so	NS	16	2000	367.0	367.0	38.0
SN74HC251PWR	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74HC251PWT	TSSOP	PW	16	250	367.0	367.0	35.0

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

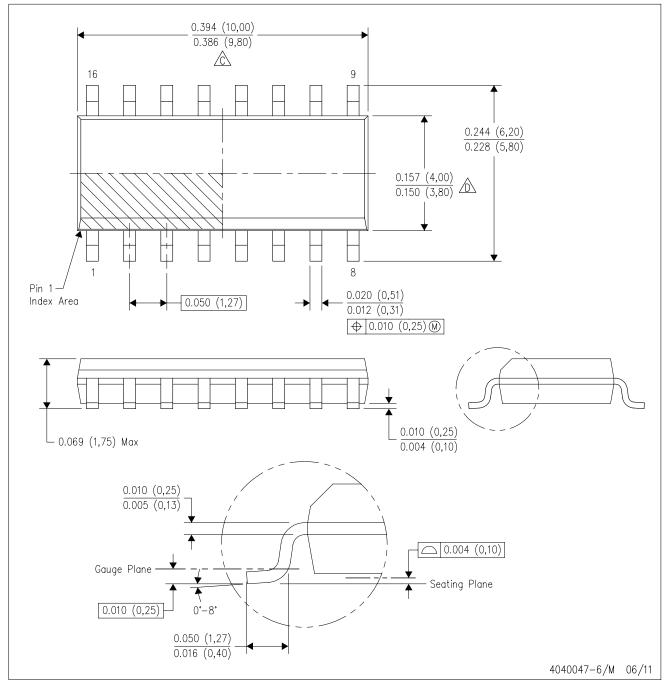


- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004



D (R-PDS0-G16)

PLASTIC SMALL OUTLINE

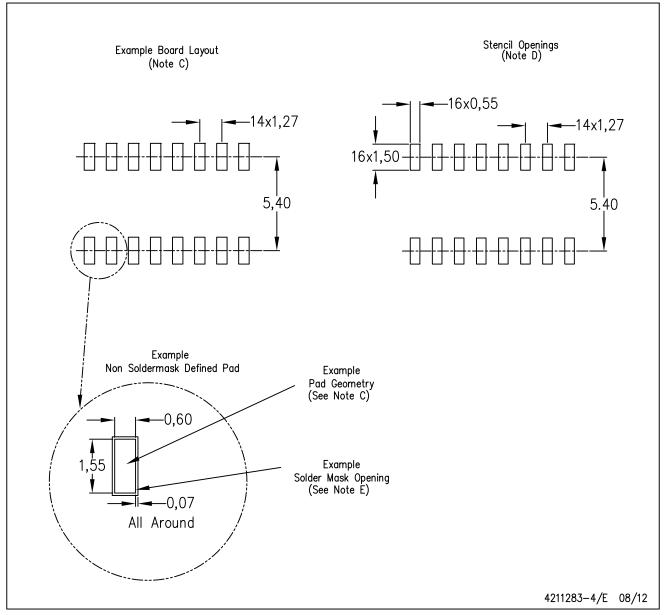


- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE

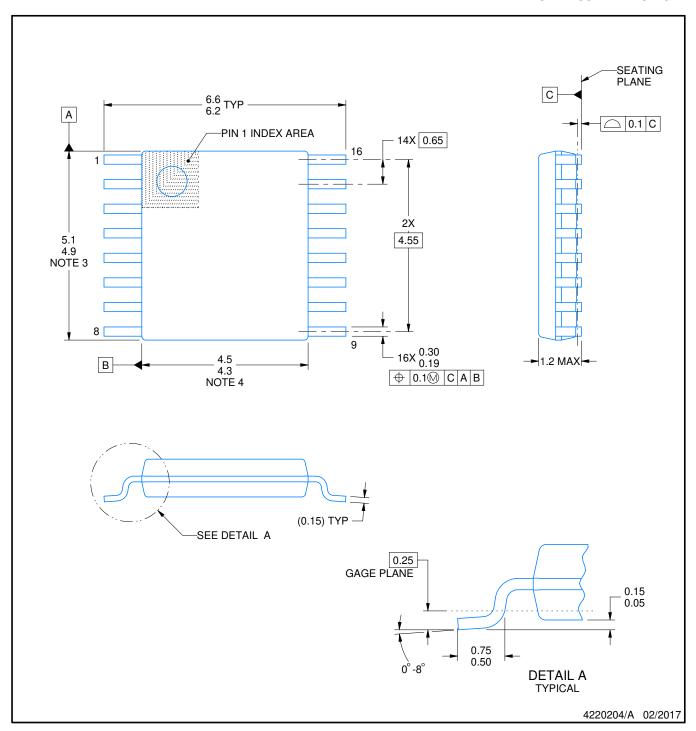


- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.





SMALL OUTLINE PACKAGE



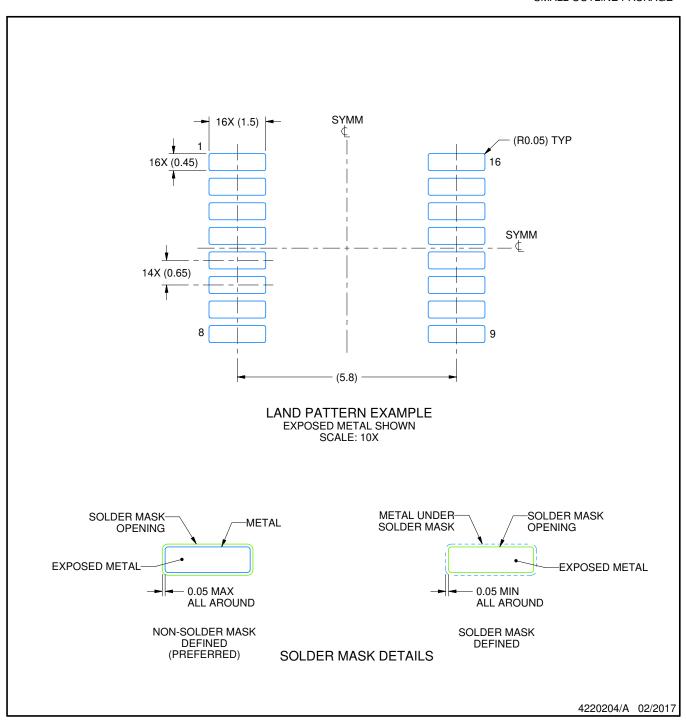
- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 2. This drawing is subject to change without notice.

 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- 5. Reference JEDEC registration MO-153.



SMALL OUTLINE PACKAGE



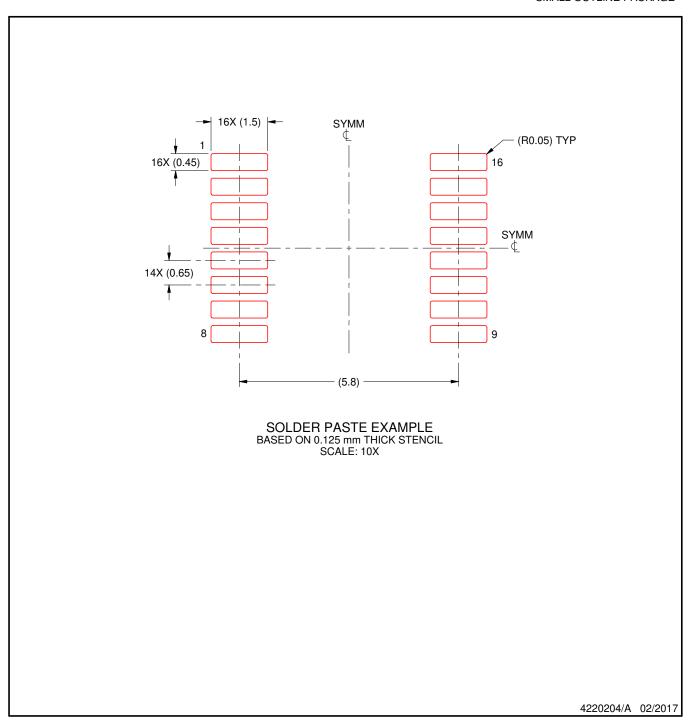
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SMALL OUTLINE PACKAGE



NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.

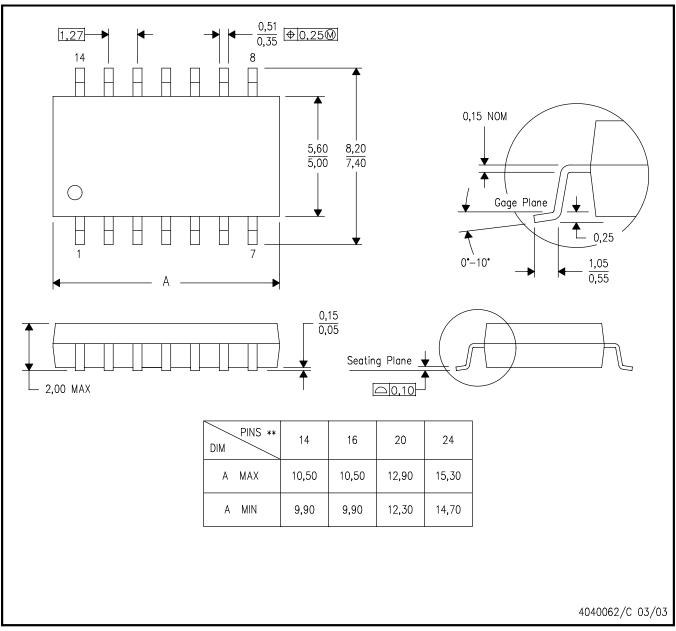


MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



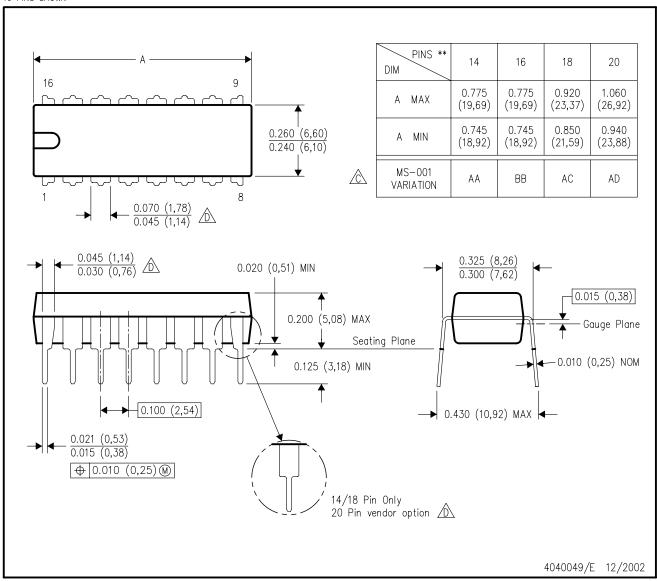
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

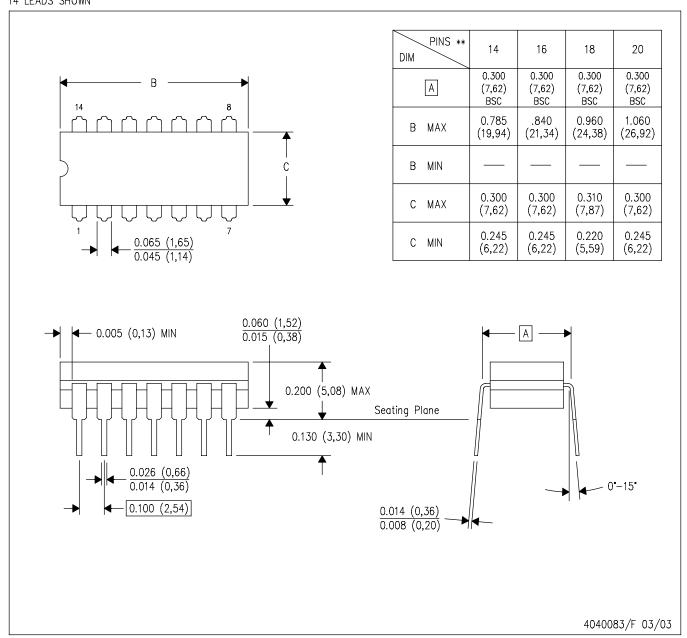
16 PINS SHOWN



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- The 20 pin end lead shoulder width is a vendor option, either half or full width.



14 LEADS SHOWN

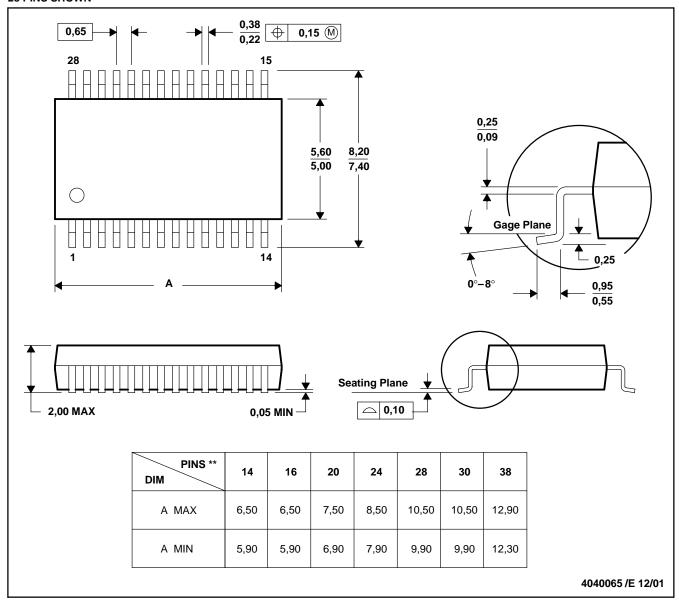


- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-150

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